

Vitamins

A vitamin is an organic compound and an essential nutrient that an organism requires in limited amounts. Vitamins are made up of carbon, hydrogen and oxygen. These are cofactors for enzymatic reactions. They are required in trace amounts and must be obtained from the diet because they are not synthesized in the body.

Two distinct types:

- Fat soluble (A, D, E, K)
- Water soluble (B – complex, C)

Water-soluble vitamins:

1. Soluble in aqueous solutions
2. Used as cofactors by many enzymes
3. Not stored in the body

Fat-Soluble Vitamins:

- Example: A, D, E, and K.
- Soluble in lipids, but not in aqueous solutions
- Important in vision, bone formation, antioxidants, and blood clotting
- Stored in the body

Cobalamin (Vitamin B₁₂):

- Consists of four pyrrole rings with a Co²⁺.
- Is a coenzyme for enzymes that transfer methyl groups and produce red blood cells.
- Deficiency can lead to pernicious anemia and nerve damage.

Sources: Dietary intake is exclusively from animal sources, e.g. milk, meat and eggs (and fortified foods). Although some bacteria can make vitamin B₁₂, it is probably not in a form that can be used by the body.

Function:

Uses:

- ❖ Formation of red blood cells
 - ❖ Maintenance of neuro tissue
 - ❖ Cure of neuro diseases, anemia
 - ❖ Sources: dairy products, meat, poultry, sea products
- Normal cell division and normal blood formation, for the normal structure and function of nerves.
 - Together with folate and vitamin B6, it is required for the maintenance of normal blood homocysteine levels; raised blood homocysteine is a risk factor for cardiovascular disease.

Deficiency:

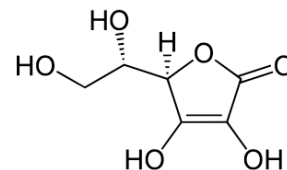
Dietary deficiency is rare, although it is sometimes seen in vegans who obtain virtually no vitamin B₁₂ in their diet. Deficiency is also caused by a lack of intrinsic factor - the substance needed for the absorption of vitamin B₁₂. This leads to a type of pernicious anaemia in which red cells are enlarged (megaloblastic), and to neurological damage - paralysis.

Hypervitaminosis: general lack of toxicity

Vitamin C - ascorbic acid:

It is required in collagen synthesis, and as a cofactor for several enzymes.

- Deficiency can lead to weakened connective tissue, slow-healing wounds, and anemia.
- It is found in Indian gooseberries, blueberries, citrus fruits, tomatoes, broccoli, red and green vegetables
- Helps form collagen
- Helps in growth and repair of body tissue and blood vessels
- Prevents scurvy
- A strong antioxidant



- Aids in absorption of iron
- Helps regulate the metabolism of cholesterol and amino acids
- Deficiency: weakness, slows wound healing, bleeding gums, scurvy
- The vitamin can be decreased by cigarette smoking, stressful injuries, stress and oral contraceptives.
- Hypervitaminosis: excessive doses can cause kidney stones and break down red blood cells.

Source: Red pepper, Strawberry.

Vitamin D(Cholecalciferol):

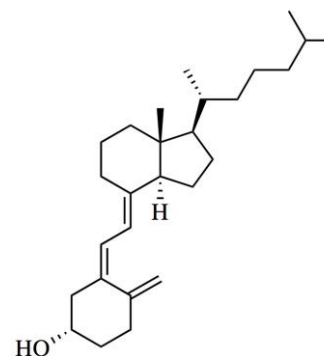
Source: Cod liver oil, egg yolk, and enriched milk.

Vitamin D is found in foods in two main forms

- Cholecalciferol and in small amounts as ergocalciferol.
- The physiologically active form is calcitriol, which is the hormone of this vitamin.

Uses:

- The ultraviolet rays from sunshine convert a compound found in the skin into cholecalciferol which is released into the blood and is eventually converted by the liver and kidneys into active hormone calcitriol. In this form it works as a hormone in controlling the amount of calcium absorbed by the intestine.
- It is also essential for the absorption of phosphorus and for normal bone mineralization and structure.
- Deficiency can result in weakened bones.
- Acts as a hormone to increase intestinal absorption of calcium
- Promote bone and tooth formation
- Prevents rickets in children and osteomalacia in adults.
- Deficiency: rickets in children and osteomalacia in adults.



- Deficiencies are rare. Some groups of people (e.g. older adults, and children) are at risk of vitamin D deficiency because of low vitamin D intake from food and/or inadequate exposure of skin to sunshine.
- Hypervitaminosis: loss of appetite, nausea, joint pains, loss of muscle tone, damage to soft tissues such as the kidney, heart, and blood vessels due to deposits of calcium.

Vitamin A (Retinol):

Retinol and beta-carotene preformed vitamin A. Carrot, Apricots.

Sources:

1. Retinol is found in liver, whole milk, cheese and butter.
2. Carotenes are found in milk, carrots, dark green leafy vegetables and orange coloured fruits, e.g. mango and apricots

Functions:

1. It prevents night blindness.
 2. Works as an antioxidant.
 3. Necessary for healthy skin, hair growth.
 4. Keeps mucous membranes healthy.
 5. Promotes bone development.
- ▽ Deficiency: night blindness, intestinal infections, impaired growth.
- ▽ Hypervitaminosis: nausea, headache, fatigue, liver and spleen damage, skin peeling, risk of birth defect.

Vitamin E (alpha-tocopherol):

Alpha tocopherol is the most active compound.

Sources: vegetable oils, margarine, green leafy vegetables, wheat germ.

Function:

- ▽ Helps breakdown polyunsaturated fats.
- ▽ Antioxidant, protect cells against oxidative damage by free radicals, for example oxidation of the lipids in the cell membranes.
- ▽ Plays a role in aging, sexual performance, or prevention of cancer and/or heart disease.
- ▽ Deficiency: disruption of red blood cell membranes, anemia

Vitamin K (phylloquinone):

Vitamin K is found in foods from both plant and animal sources and is also made by bacteria in the gut.

Sources: pork and beef liver, eggs, spinach, cauliflower, broccoli, tomatoes.

- Essential for clotting of blood (vitamin K is named antihemorrhagic vitamin)
- Normal bone structure
- Deficiency: increased bleeding and hemorrhage